BEARING CAPACITY OF PARTIAL SKIRTED FOOTING CLAY UPPER SAND

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declare that this Final Project is prepared and presented by myself, except the quotations and summaries that I have explained from all of the sources. If later is found that this Final Project is a plagiarism product, then I will accept any legal consequences that may be imposed to me.

Surakarta, 2017

Mohammed A A Hanani

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ABSTRACT

Capacity bearing as a major factor for the design foundation, is mandatory to achieve carrying capacity, skirt attached to the cradle product capacity. In soil sand, the study attempted twelve laboratory results with a circular steel pause of different diameters with different moisture formulations and compaction methods, from which the skirt can be summed up to increase the final capacity, increasing the length and also this. , Decline in settlements when viewed on the same payload, the longest round has the best situation. Public settlements decreased, when observed on the same charge, 5.00 KN. Circular and circular dishes with the longest skirt have the best finishing condition.

Keywords: *bearing capacity, circular footing, foundation, sand, partial skirt.*

1. INTRODUCTION

Bearing capacity is the ability of the soil to keep pressure on engineered buildings without damage by accompanying large settlements. Therefore, the analysis of the general settlement must be done because of the structure of the uncertainty over the excessive settlement. The main carrying capacity of the soil (g) is the gross pressure at the bottom of the foundation where the soil fails to be called the final carrying capacity. With the only benefit of failure, the net end carrying capacity is shared with certain safety factors that will provide net carrying capacity. Failures can be grouped into three modes: a) common failure b) local shear failure, (c) punching shear failure. The general sliding failure involves a total breakage of the underlying soil. There is a continuous step from the ground to the ground. When there is a plot versus the completion of a foothold, there are different ones where the foundation fails, and this is addressed to Qult. The Qult score is divided by the width of B and L footing as the highest carrying capacity (qult) of foothold. Main carrying capacity. Local shear failure may be considered as a transitional phase between general shear and punching shear. Due to the transitional nature of local shear failure, the carrying capacity can be maintained as the first major nonlinearity on the loading curve (open loop) or at the point where the settlement increases rapidly. Lowering shear corruption is not the same as the others. To punch the shear, the soil outside the laden area is relatively uninvolved and there is little movement of the soil on either side of the footing. The method used to improve the carrying capacity is to increase the depth of the foundation. At deeper depths, more pressure on the ground is higher; Therefore the soil is denser at deeper depths. Checks, this indicates a higher carrying capacity. This only applies to less soil cohesion such as sandy soil and gravel. This method of increasing soil bearing capacity is not applicable if the undercoat material grows deeper as its depth increases. This method has limited usage due to increased depth, weight and foundation cost also increased. The second drain the ground with the addition.

2. METODE

The purpose of this study is to clarify the relationship between clay settlement and overlapping. To apply experimentally about partial foothold behavior, laboratory tests were performed on a small-scale model. The equipment used for this study is six partially circular footing models. The skirt has a thickness (Ts) of 2 mm for an outer diameter of 75, 100, 150 mm, and a length of 100, 150 mm for each diameter. The foothold itself has a thickness of 10 mm (Tf) and also has a diameter equal to the outer diameter of the skirt. Therefore, the ratio of long skirt (L) to the footing diameter (D), L / D is 0,50,0.67, 0,75, 1,00 (75/75), 1,00 (100/100), 1 , 00 (150/150), 1.33, 1.5, and 2.00. All foothold models are formed from steel plates. The skirt is welded firmly and accurately attached to the circumference of the footing. Each footing model has a notch in the center of the upper face to install the piston. Two open holes are mounted on the top surface of each footing model for rising surfaces inside the skirt.

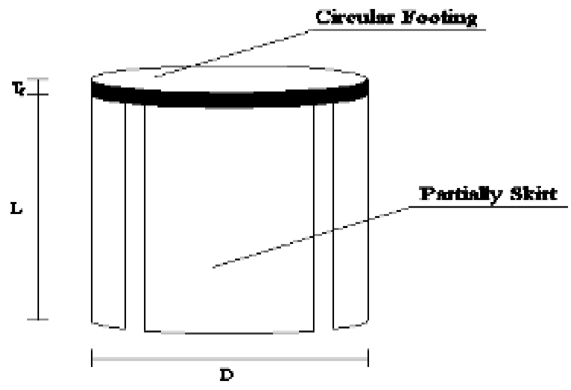

Figure 1 Skirted Circular Footing Model

Soil bin. It is made of one cylinder as high as 500 mm and a diameter of 600 mm, with the upper side circle open. The loading frame machine has a maximum of 250 kN, digital device loading and a two-dial gauge attached vertically to the top surface of the footing for visible displacements. The piston is long and conical at the end, just above the notch.

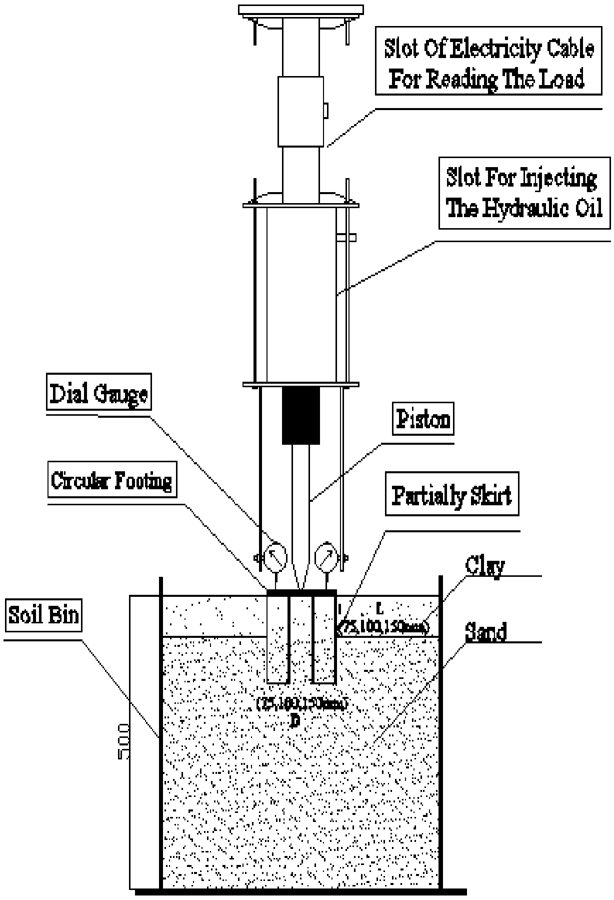

Figure 2 Sketch Setup of Testing Procedures

Generally, this research is done by several steps, it is described as follows:

1. Prepare and organize tools and clay materials and sand that will be used in research. Clay and sand should be taken from the same location and conditions. The clay and sand are put in dry air.
2. Investigation of dried clay and sand (at room temperature) to obtain moisture content from dried air.
3. And the next step is to held the laboratory experiments that is involving the covered foundation.

   First, the clay is mixed with 400 ml of water and sand mixed with 100 ml of water. Second, the mashed clay and sand in the soil test, for the first layer is sand with 100 hits in each layer, and for one last layer is clay with 100 hits. Third, plug the clay and sand bin that has been compacted on the CBR machine. Fourth, for the first test, place the wrapped foundation that has L / D = 0.5, right in the middle of the test spot, and the press blanket to match the coated soil, observe the sand surface on the sheet through two Open the hole in the foundation. Fifth, set exactly two gauges on the left and right of the foundation, to touch the surface above the foundation. This tool is used to determine the decline that occurred. Then, set the piston right in the center of the foundation. Sixth, the foundation is covered in the right position, then turn on the CBR tool, observe and write down all the changes that occur in each test. The reduction of value will be shown by two dial instruments associated with the foundation. Finally, stop the CBR engine when the power has increased significantly, as an indication that the foundation has been maximized. The next laboratory test, do the same test sequence above, but replace the different foundations.
4. Because of the closed comparative data between the foundation and foundation is not closed, therefore conducted laboratory tests on the foundation is not covered. This step has not been covered, with diameters of 75, 100, and 150 mm.
5. Analyzing all data from laboratory test results from stage I to stage IV, used for the conclusion of all tests that have been done.
6. Conducting the next experiment on laboratory, perform the same test sequence above, but only replace the foundation with different sizes.
7. The Last step is analyzing all the data from the laboratory experiments result from the Step I until the Step III, it is used to obtain the conclusion from all the test that has been conducted.

3. RESULT AND DISCUSSION

Skirted and unskirted tests have the same moisture content and compacting technique. The water-drained water content begins as a reference for all test phases. Then, the test results show the relationship between the load and the settlement that occurs on each footing. As shown in Figure V.1-V.3.

Note: Due to the unreasonable data I get at 75 mm length, I have not added it to the explanation, because the results do not match the theory.

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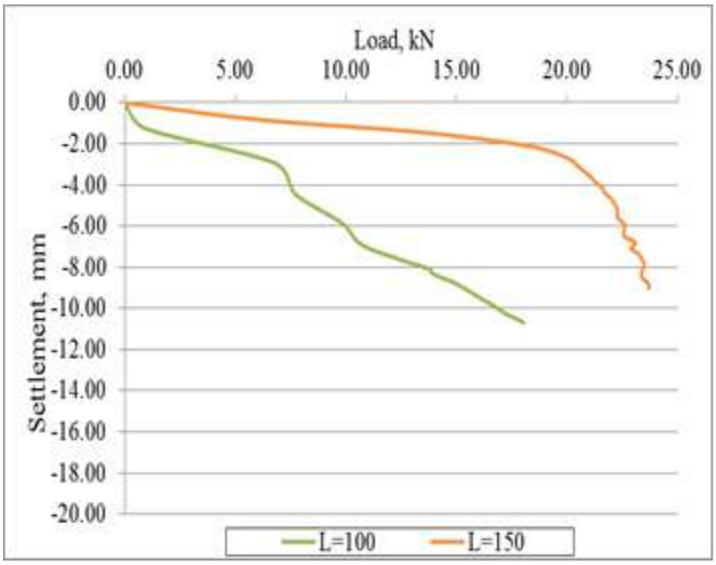


Figure V.1. Load-settlement rrelationship for footing diameter 75 mm

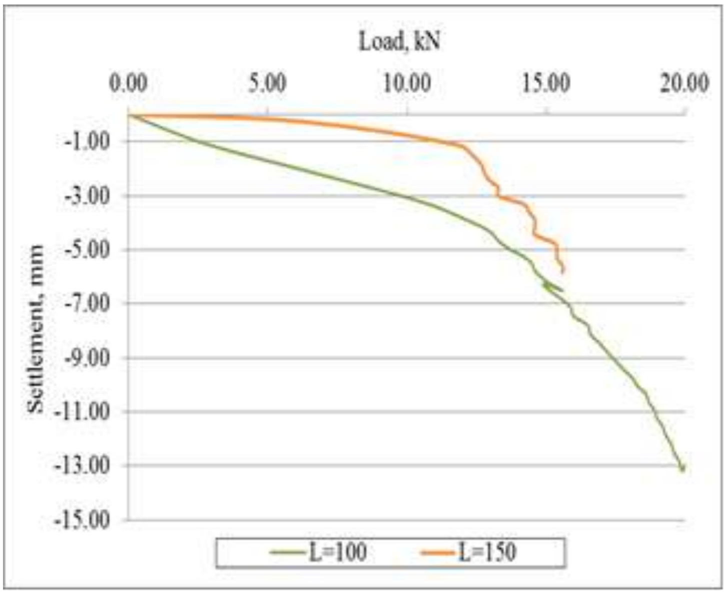


Figure V.2. Load-settlement relationship for footing diameter 100 mm

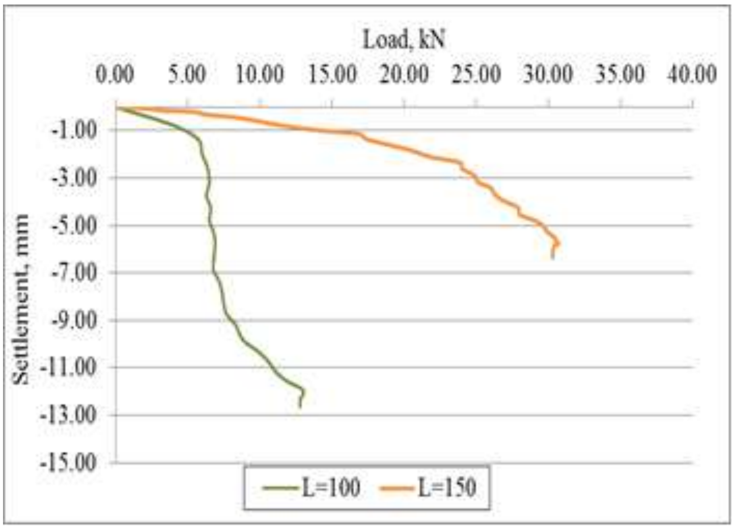


Figure V.3. Load-settlement relationship for footing diameter 150 mm

In this graph, as we can see in the relationsip between settlement and load at different lengths with diameter 75 mm, we can see that the foundations are the worst. But as we can see in the graph the length is greater then the effect is less for the foundation, in other words if the length is the greater one, then it can withstand the load, so the settlement will be smaller. So in this experiment when the length is 150 mm, the choice is better than the length of 100 mm because the settlement is smaller at 150 mm from the length of 100 mm.

3.1 Settlement in Similar Load as Reference

To detect the settlement change which is the advantage of adding a skirt to a circular footing, it must be tested on the same amount of charge (P, KN). 5 KN has been taken. There is no obvious additional requirement in determining the total load, KN load, Figure V.1-3.

On Figure V.6-8, we can take take analysis of the settlement on the 2 kN of load value which are same. And furthermore, Table V.4. provides the settlement change result information which is effected by the length different of te skirt on the exact same circular footing diameter.

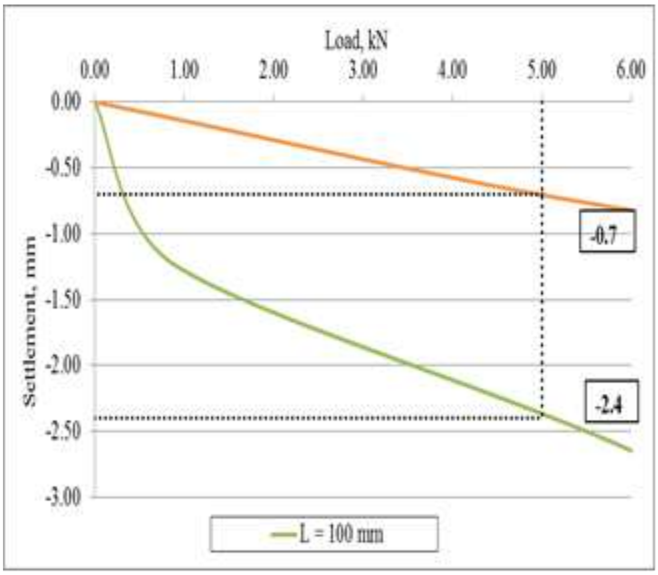


Figure V.6. Ssettlement analysis on footing diameter 75 mm

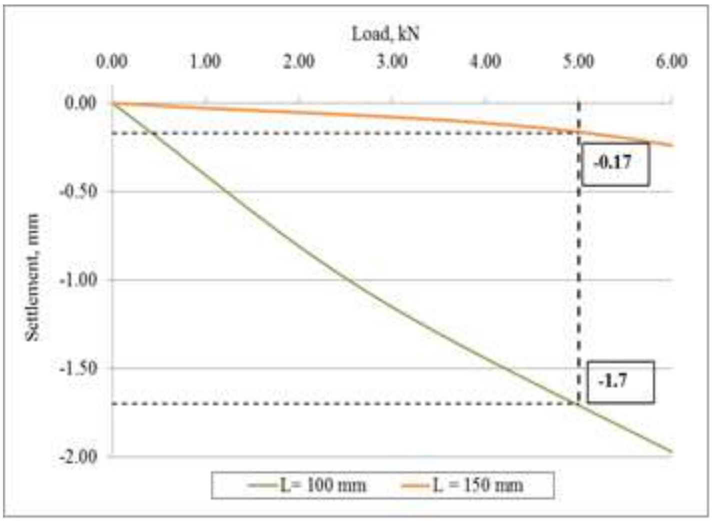


Figure V.7. Ssettlement analysis on footing diameter 100 mm

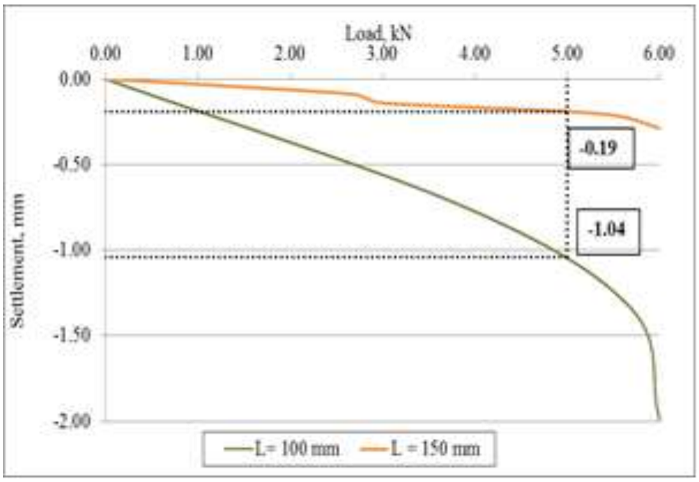


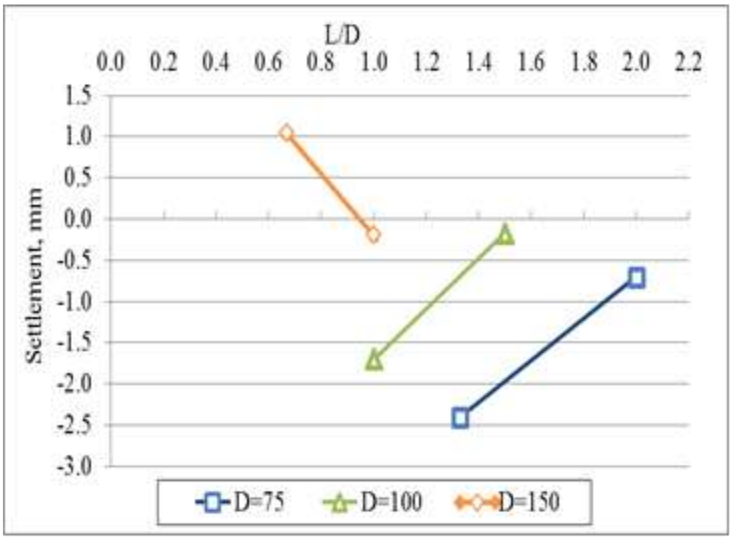
Figure V.8. Ssettlement analysis on footing diameter 150 mm

From figure 6-8 we can see that the value of the settlement at the same load is 5.00 KN load. Table V.1. provides the result information of the magnitude of the settlement that is caused by the length of the different partial skirt at the same the footing foundation diameter.

Table 1 Settlement magnitude on load is 1.5 KN

Footing diameter D (mm)	Skirt length, L (mm)	L/D	Settlement (S) on 5 KN, (mm)
75	100	1.33	2.4
75	150	2	0.7
100	100	1	1.7
100	150	1.5	0.17
150	100	0.67	1.04
150	150	1	0.19

The different condition on L/D ratio is shown on Table 1, which is obtained from the similar diameter and different skirt length, the settlement decreased when the L/D ratio increased. The magnitude of the settlement which is 5.00 KN load, it is caused by the length of the skirt, it indicates that if the length of the skirt is being greater, the value of the settlement becomes smaller.



The relationship between the L/D ratio.

3.2 Load in Similar Settlement as Reference

To obtain the value of the load that is effected by the settlement, the load value must be taken when the same settlement condition occurs. The reference settlement of 3 mm for all foundations is caused by 5 mm the settlement load value of all samples. So the value of load will be increased when length of the skirt is being increased when in the same diameter for all sample.

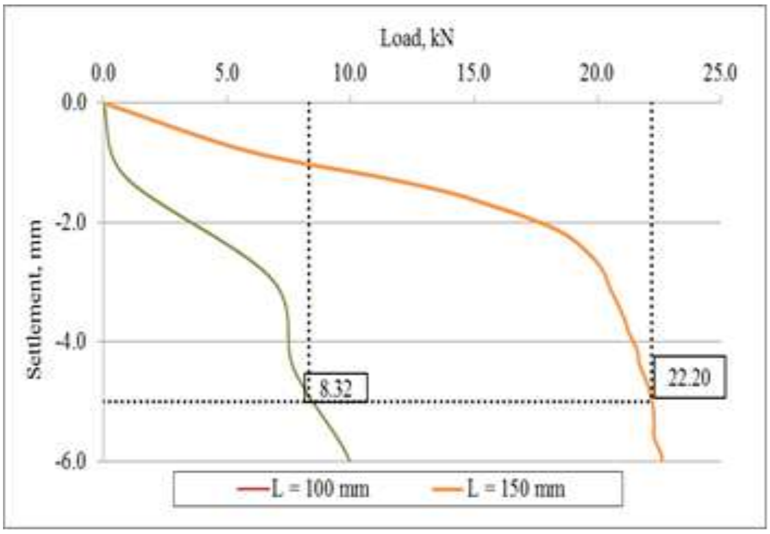


Figure 1Load in Similar Settlement on Footing Diameter 75 mm

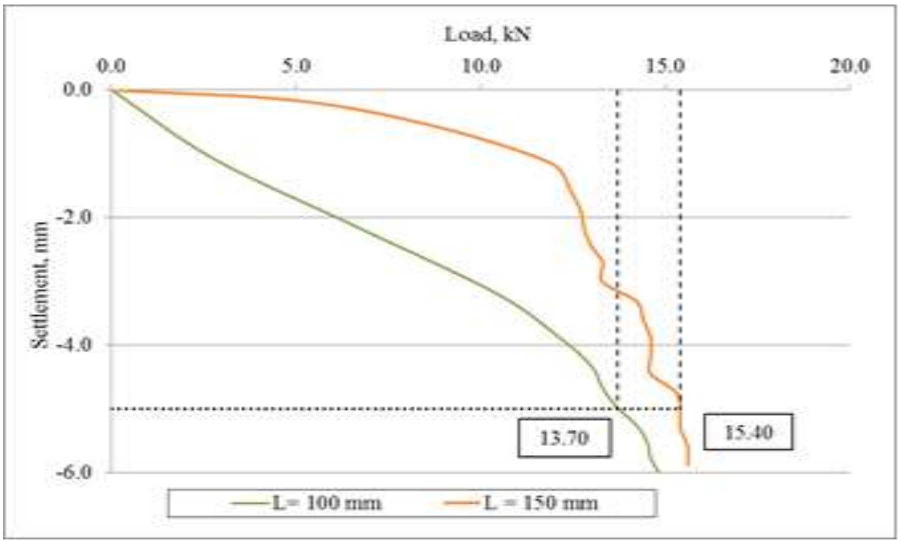


Figure 2Load in Similar Settlement on Footing Diameter 100 mm

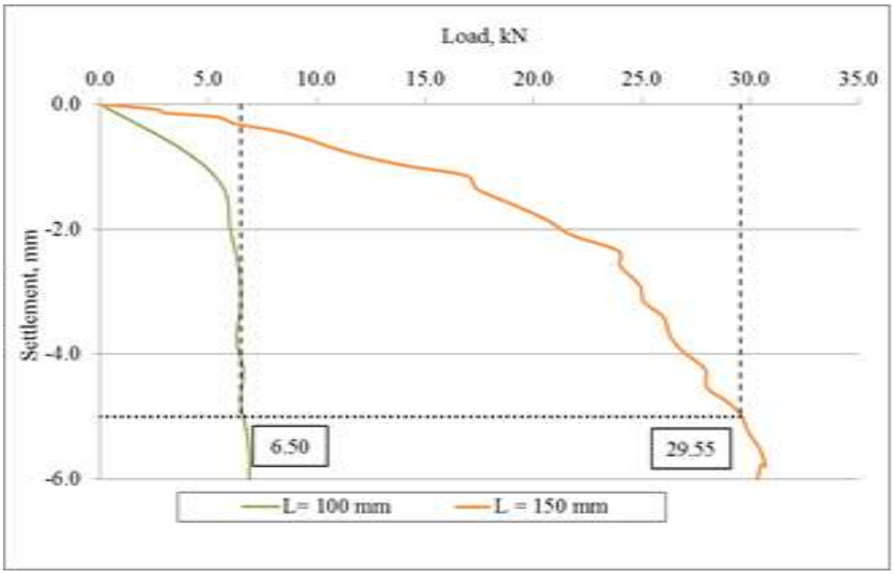


Figure 3Load in Similar Settlement on Footing Diameter 150 mm

Table 2 Load Magnitude in Similar Settlement on 3 mm

Footing diameter D (mm)	Skirt length, L (mm)	L/D	Area	Load (P) on 3 mm, (kN)
75	0	0.00	4419.64	2.54
75	100	1.33	4419.64	7.08
75	150	2.00	4419.64	8.93
100	0	0.00	7857.14	4.12
100	100	1.00	7857.14	14.35
100	150	1.50	7857.14	16.42
150	0	0.00	17678.57	5.17
150	100	0.67	17678.57	13.42
150	150	1.00	17678.57	24.35

It also occurs on L/D ratio, which is got on the similar diameter (D) and different length (L). The higher L/D ratio the greater the load that is generated.

4. CONCLUSIONS

Based on research undertaken and data analysis, the research meets the answer of the problem formulation. As following:

1. The additional partially skirt on the circular footings is very effective to improve the ultimate bearing capacity of circular footings. By the same diameter of circular footings, as the length of partially skirt increases, the ultimate bearing capacity increases.
2. There are two different results for the effect of partially skirt length to footing diameter ratio, L/D. If it is observed on same footings diameter and different partially skirt length, the

result shows that the ultimate bearing capacity value tend to increase over the initial value. The other hand, if it is observed by on the same skirt length with different diameter, the result shows ultimate bearing capacity down unstable.

3. The partially skirted that is attached in circular footings improve the bearing capacity of circular footings and reduce the impact of settlement, the partially skirted is using less material compared to conventional skirted.

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